Project Risk Management
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Project Risk Management; The Project Planner's Role

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US Army Corps
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The Problem

- 2007 Civil Works Customer Satisfaction Survey results USACE ranked lowest in

  "Timeliness" and "Cost"

- A continuum exists between optimistic and conservative scheduling and cost estimating within which lies realistic scheduling
- Risk Management is a set of Project Management processes that will help PDTs to develop "Realistic Plans" and manage customer expectations
- Improving Risk Communication and Risk Analysis Informs Stakeholders and Decision Makers

Background Guidance

- **Risk and Uncertainty**. ER1105-2-100, page 2-11 states:
- "The P&G state that planners shall characterize, to the extent possible, the different degrees of risk and uncertainty inherent in water resources planning and to describe them clearly so decisions can be based on the best available information. Risk-based analysis is defined as an approach to evaluation and decision making that explicitly, and to the extent practical, analytically incorporates considerations of risk and uncertainty.
- Risk-based analysis shall be used to compare plans in terms of the likelihood and variability of their physical performance, economic success and residual risks. A risk-based approach to water resources planning captures and quantifies the extent of risk and uncertainty in the various planning and design components of an investment project. The total effect of risk and uncertainty on the project's design and viability can be examined and conscious decisions made reflecting an explicit trade-off between risk and costs."

Current Initiatives

- Initiatives to Improve Accuracy of Total Project Costs in Civil Works Feasibility Studies Requiring Congressional Authorization (CECW-CP Memo 19-Sep-2007)
  - ✓ PCX ITR of all cost Estimates
  - ✓ Formal Cost risk analysis for projects>$40M: Risk Informed Decision Making using Crystal Ball
  - ✓ Project Delivery Teams uses project risk management principles and methods from the Project Management Institute's Project Management Body of Knowledge in developing a project risk management plan that includes a risk analysis and risk response plan to support the cost risk analysis.
  - ✓ Development of this plan is supported by our Project Management Business Processes (PMBP) # 8405 under Project Management Plan (PMP) requirements.
  - ✓ Together the project risk management plan along with the cost risk analysis will produce a defensible assessment of the level of cost to budget such that this cost has an acceptable probability of not being exceeded

Project Risk Management: What and Why

- What:
  - ✓ Dealing with events that can impact your project, whether those events are known or unknown to the project team
  - ✓ Managing “the cumulative effect of uncertain occurrences adversely affecting project objectives”
  - ✓ Includes risk and uncertainties associated with the triple constraint: Scope, Schedule and Cost
  - ✓ What can go wrong? What will we do (both to prevent the harm from occurring and in the aftermath of an "incident")? If something happens, how will we pay for it?

- Why:
  - ✓ So you can meet your project goals:
    - Cost
    - Schedule
    - Technical performance
  - ✓ Tool for developing more *“Realistic”* plans, determines confidence in the schedule and cost. Defines what reserves and contingencies are needed.
  - ✓ Tool in managing customer expectations

Project Risk Management: Planning Phase

- **What is your "Project" during Planning Phase of the Project Life Cycle?**
  - ✓ During Feasibility, your "Project" is the completion of the Study.
  - ✓ Risk Management on the Study

- **Project Risk Analysis during the Study process:**
  - ✓ Project Risk is the implementation risk of the alternatives and the selected plan
  - ✓ Risk Management on the design and construction.

Project Risk Management PMP: What, When, Who and How

- **Determining the roles and responsibilities**
  - ✓ Who will have responsibility for risk management decision making (e.g., Risk Management Board [RMB] or Project Review Board?
  - ✓ Who chairs the RMB [e.g., program manager (PM), deputy program manager (DPM)]?
  - ✓ Who maintains and updates the risk management process and how will it be done (e.g., program management, PDT)?
  - ✓ Who develops the RMP (e.g., risk manager, planner, PM)?
  - ✓ How will we lead risk management implementation and training others in risk management principles (e.g., risk manager)?
  - ✓ Who and how will we perform risk management (e.g., everyone)?
  - ✓ Who assigns focal points to a given risk issue
  - ✓ How will we draft risk analysis and which group approves the results
  - ✓ Who develops draft risk handling plans and which group approves the plans and how will we monitor them.
  - ✓ Which group collects and examines risk-monitoring metrics

Project Risk Management: Who cont.

- **Risk management is a team function.**
  - ✓ **This stems from the pervasive nature of risk and the impact that risk-handling plans may have on other program plans and actions.**
  - ✓ **In the aggregate, risk planning, risk assessment, risk handling, and risk monitoring affect all program activities and organizations.**
  - ✓ **Any attempt to implement an aggressive forward-looking risk management program without the involvement of all project subordinate organizations could result in confusion, misdirection, and wasted resources. The only way to avoid this is through teamwork among the functional organizations.**
  - ✓ **The project management organizational structure can promote teamwork by requiring strong connectivity between that structure, the various PMO organizations, and the prime contractor. The teams may use independent assessments to assist them, when required**

Planners role in Project Risk Management

- Planning Roles
  - ✓ Engaged in all steps of RM (especially those in the project planning phase)
  - ✓ Awareness and communication of constraints, opportunities, assumptions and uncertainties
  - ✓ Assist PM and other team members to develop Scopes of services
    - Allows PDT to provide an optimistic, most likely and pessimistic duration for each scoped activity
    - PDT lists out assumptions and risks for the duration estimates and tasks listed
    - Activity duration estimates, assumptions and risks are used to prepare a risk register and realistic schedule and budget

- Team Effort: Key Factors to Team Success
  - ✓ Key Processes
    1) Team Meetings
    2) Roles and Responsibilities
    3) Communications
    4) Decision-making
    5) Measuring Performance
    6) Feedback and Recognition.
  - ✓ Key Behaviors
    1) Mutual trust
    2) Interdependency
    3) Accountability
    4) Valuing individual differences
    5) Transparency
    6) Learning.

Project Risk Management: How- the basics

- Use all of the talent and ability of the team to deal with the major risks!
- Start risk management at team formation
- Use entire team to “brainstorm” risk list
- Team discusses each risk and “votes” on perception of impact and probability
- The risk with the highest impact/probability products are the high risk list that the team must deal with
- Develop risk management worksheet for each high risk.
  - ✓ These worksheets and the process documentation are the entire Risk Management Plan
- Review status regularly with the team, take appropriate corrective actions and make appropriate changes
- Execute the risk management plan when a “trigger” is reached.
  - ✓ Put the actions into the project plan with owners and dates
  - ✓ Track execution
- Periodically review project (team activity) for additions or deletions to risk plan

Risk Management Process: How

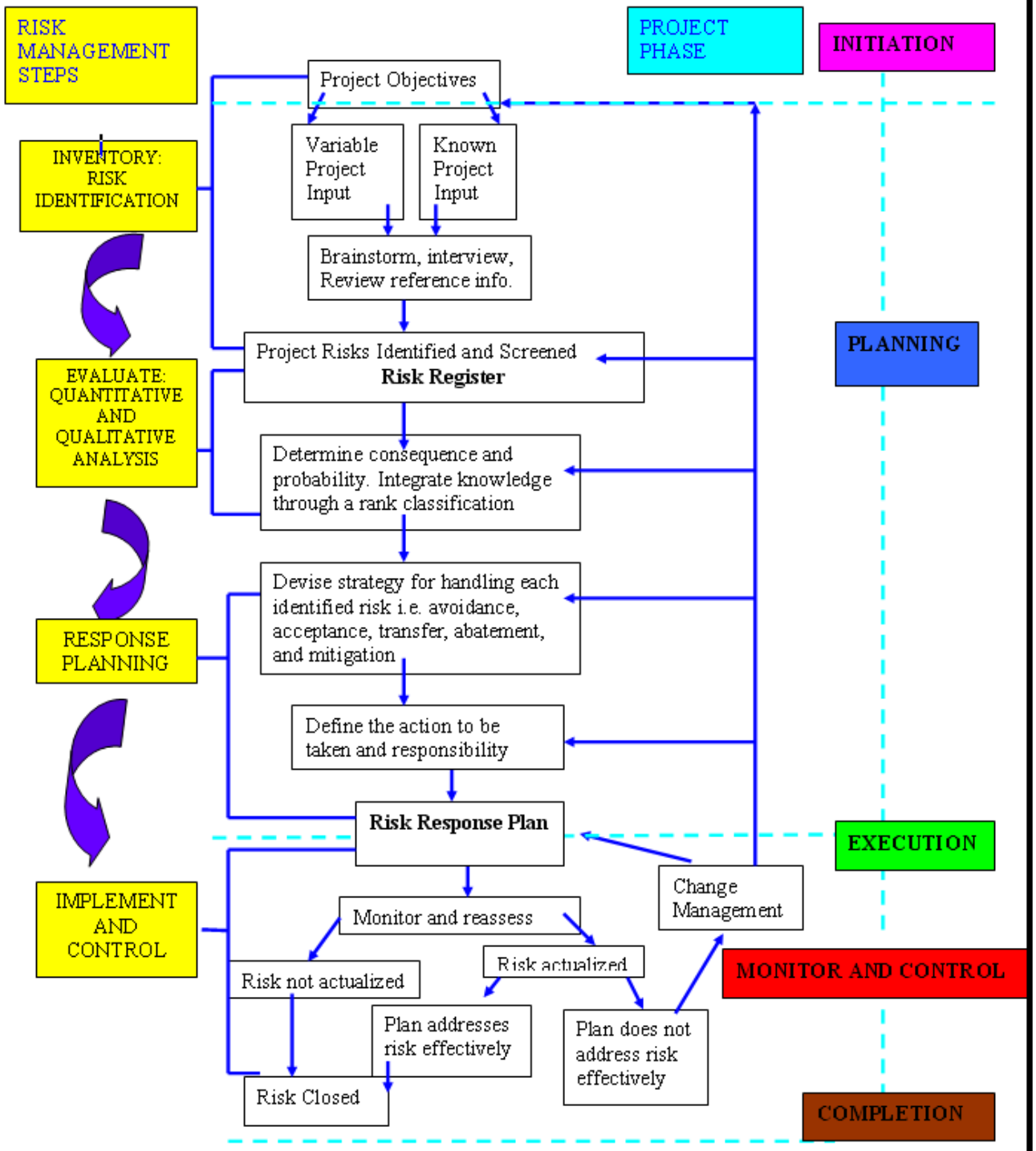
- PMI. PMBOK® : Risk Management is one of the 9 Knowledge Areas and contains 6 Processes

Process	Who	Process Group
Risk Management Planning	PM, Corporate Board	Planning
Risk Identification	PDT (especially PM, Planning, RE, Environmental, Designers, Cost Estimators, Contracting, & Construction)	Planning
Risk Qualitative Analysis	PDT	Planning
Risk Quantitative Analysis	PM, Cost Estimator	Planning
Risk Response Planning	PM, Corporate Board	Planning
Risk Monitoring and Control	PM	Monitoring and Control

Project Risk Management Plan

- "Plan your work and work your plan"
- End product of RM planning is the Risk Management Plan.
- RPM describe the RM process, products and define the RM budget

- **INTRODUCTION.**
- **PROGRAM SUMMARY.**
- **DEFINITIONS.**
- **RISK MANAGEMENT STRATEGY AND APPROACH.**
- **ORGANIZATION.**
- **RISK MANAGEMENT PROCESS AND PROCEDURES.**
  - ✓ **RISK PLANNING.**
  - ✓ **RISK ASSESSMENT.**
  - ✓ **RISK HANDLING.**
  - ✓ **RISK MONITORING.**
- **RISK MANAGEMENT INFORMATION SYSTEM, DOCUMENTATION AND REPORTS.**



Risk Management: How

- When: throughout the project lifecycle
- Cost : Risk Management cost can range from $15K-$100K + depending of size of project, complexity and controversy
- Who: Risk Analysis PDT member/ Facilitator

Risk Identification

Inputs	Tools & Techniques	Outputs
1 Enterprise Environmental Factors 2 Organizational Process Assists 3 Project Scope Statement 4 Project Management Plan 5 Risk Management Plan	1 Documentation reviews 2 Information Gathering Techniques **Brainstorming** **Delphi** **Interviewing** **SWOT** 3 Checklist analysis (Risk Breakdown Structure) 4 Assumptions analysis 5 Diagramming Techniques **Cause and Effect diagrams** **Influence diagrams**	1 Risk Register

Risk Identification: Risk Register

Risk #	Risk Description	Date Identified	Risk Cause/Event	Category	Probability / Likelihood	Severity / Consequence	Impact
	Problem Issue	When risk was defined	What is the source of the risk	Type of risk	Initial take on probability of occurrence (high, medium, low)	Significance to project objectives (high, medium, low)	Impact with respect to Triple Constraint

Scope of Service Form

FORM P0001
Effective 02/02/07
Rev 3

SOS Number:		Revision:	FY07Qtr III	Project Manager:	Nicole Ortega
Project:	Pajaro River GRR			PM Phone Number:	x6734
Task:	Real Estate Cadastral and Mapping			Team Member:	Peter and Scott
Organization:	Goesciences Section			Member Phone Number:	x6792 & x6788
Last Updated:	March 28 2007			Labor Charge Code:	00A417

Tasks	Res Type	Total Budget	Fiscal Year Distribution				
			Start	Finish	CFY	Issued	CFY+1
1. Attend bi-weekly PDT mtgs	L3L8L40	2046	01-Apr-07	30-Jun-07			
2. Prepare Maps and Tract Registers for 1966 Plan Area	L3L8L40	9858	15-May-07	31-May-07			
3. Prepare Maps for Ring Levee Alternative and Tract Register	L3L8L40	5766	26-May-07	15-Jun-07			
4. Prepare Maps for other alts for Market Analysis	L3L8L40	10602	12-Jun-07	15-Jul-07			
5. Prepare Maps for Tract Registers for Final Design for Gross Appraisal	L3L8L40	9858	01-Jul-07	15-Jul-07			
6. Estimate Ag Lands impacted by 1966 plan	L3L8L40	5040	17-May-07	30-May-07			
7. Calc. veg/mitigation impact of 1966 plan	L3L8L40	8640	31-May-07	15-Jun-07			
8. Assist in preparation of maps	L3L8L40	10080	15-Jun-07	15-Jul-07			
	Totals:	$61,890					

Task Description:

1. attend bi-weekly meetings and any other team meetings for real estate coordination
2.-5 coordinate with Appraiser and prepare maps for appraiser
6-7 work with environmental planner to determine impacts from project and mitigation

Assumptions/Risks:

1. meetings are 1 hour long and additional 1 hour a week meeting with other team members
2-3 civil design alterantive footprint completed by mid May, footprint is within existing parcel data also for task 3 dependent on sponsor acceptance of footprint
5 only if another plan is carried forward time may be decreased if only updating current Gross Appraisal
6.data from environmental planner and vegitation map current
8. may be longer, depending on the needs of other PDT members

Durations based on professional judgement and current workload leveling. If project is delayed, activity durations may not be met, due to reduction in staff come December 2007.

Ken Harrington <s>	Nicole Ortega <s>
CESPN-____ (Resource Manager)	CESPN-PM
Scott Hicks and Peter Krembs <s>	28-Mar-07
CESPN-____ (PDT member)	Date

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Risk Identification: Risk Breakdown Structure

- Common Risk Factors for any project:
  - ✓ Relationships
  - ✓ Financial
  - ✓ Market
  - ✓ Project outcome
  - ✓ Technical
  - ✓ Quality
  - ✓ Legal and regulatory
  - ✓ Resource Risk
  - ✓ Budget Risk
  - ✓ Schedule Risk
  - ✓ Scope Risk
  - ✓ Contractor Risk/ Supplier Risks
  - ✓ Natural Hazards

- Generic RBS (handouts)

Example Feasibility Risk Identification

Risk #	Phase of project	Risk	Risk Event: Cause
1	Reconaisance	Study not initiated in a timely manner	funding or authority not provided to initiate recon study
2	Reconaisance	no federal interest	purpose, flows or damages not sufficient
3	Reconaisance	delay in signing FCSA	availablity of sponsor funding
			scope of initial PMP too expensive
			project not receive federal appropriations
			sponsor's priorities change
4	Feasibility (F2)	Failure to achieve local conscensous	Public non supportive
5	Feasibility (F3)	hydrology flows misrepresentative	historical record is insufficient
			calibration of other flow curves not representative of watershed
			sponsor's lack of understanding of corps process
			new storm of record after hydrology certification
6		hydraulic floodplains not representative	flows not accurate
			project hydrology not certified
			models used not properly calibrated
7		damage calculations are low	GIS data is not accurate
			inventory not representated
			geotech failure curves not properly calculated
8	Feasibility (F4)	re-analysis of alternatives	alternatives dropped because of sponsor or public rather than because of justification based on true planning
			public planning process driving Corps process
			initial biological assessment or utility survey not thorough enough
			inexperience of PDT members
9		cost estimates not performed in timely manner	availability of Real Estate or Cost Estimators time
			inexperience of real estate appraisals or cost estimating
10	Feasibility (AFB)	NED plan not 100 year level of protection	benefits lower than cost of damages
11	Feasibility (Draft Rep	re-analyis of alternatives	result of public comments, agency biological opinions
12	Chief's Report	delay in HQ approval	analysis not complete
			availability of HQ policy reviewers
			public comments
			benefit to cost ratio not high enough
			delayed answers from PDT to HQ policy questions

Risk Qualitative & Quantitative Analysis

Inputs	Tools & Techniques	Outputs
1 Risk management plan 2 Identified risks 3 List of prioritized risks and risk conditions 4 List of risks for additional analysis and management 5 Data precision 6 Scales of probability and impact 7 Historical information 8 Expert judgment 9 Other planning outputs (Project status, Project type) 10 List of potential responses	1 Risk probability and impact scoring 2 Probability/impact risk rating matrix (Statistical tools) 3 Project assumptions testing 4 Data precision ranking 5 Public review 6 Interviewing 7 Sensitivity analysis 8 Decision tree analysis 9 Simulation (Monte Carlo) and modeling 10 Brainstorming 11 Probability analysis 12 Delphi method 13 Utility theory 14 Decision Theory 15 Scenario 16 Earnings At Risk (EAR) 17 Expected Monetary Value (EMV) 18 Value At Risk (VAR) 19 Shareholder Value Added (SVA) 20 Benefit/cost ratios 21 Expert systems	1 Overall risk ranking for the project 2 List of prioritized risks 3 List of risks for additional analysis and management 4 Trends in qualitative risk analysis results 5 Prioritized list of quantified risks 6 Probabilistic analysis of the project 7 Probability of overrunning the project cost and time objectives 8 Contingency reserve amounts needed

Risk Qualitative & Quantitative Analysis: Risk Register Update

Output from Qualitative and Quantitative Analysis

Risk #	Risk Description	Date Identified	Risk Cause/ Event	Probability	Consequence	Impact	Rank Classification
	Problem Issue	When risk was Defined	What is the source of the risk	Impact with respect to Project (high, medium, low)	Impact with respect to Project high, medium, low)	Overall Impact Budget Sched. Scope	Significance to project Objectives (high, medium low)

Example Feasibility Risk

Risk #	Phase of project (FE=Feasibility DE=Design CO= Construction)	Risk	Risk Event: Cause (Factors that trigger the risk)	Likelihood of Occurance (Low Medium High)	Severity of Schedule Impact	Recommended Approach for Realistic Schedule Notes (months added to unconstrained schedule)
			Project Management Plan not approved, comprehensive Inaccurate, incomplete. Information upon which WBS is constructed and schedule developed is incomplete. Lack of Knowledge	L	L	(add 1 month)
			Complexity due to range of plans	M	M	(add 3 months)
6	FE	Planning uncertainty and complexity		H	M	(add 3 months)
			Status of USFWS, NMFS, DFG, SHPO, HRTW coordination.			
			Is the NEPA process fully developed and integrated into the project			
			EA or EIS required ESA presence	L	M	(add 3 months)
			Any opposition,	M	M	(add 3 months)
7	FE	Environmental compliance	Regulatory PDT member not engaged	H	H	(add 6 months)
				L	L	(add 1 month)
			In-house labor is fully resourced. Need to	M	L	(add 2 months)
8	FE	Resource availability	engage contract services	H	L	(add 2 months)
9	DE	Scope change	Cost desired alternative exceed project limits	L	M	(add 3 months)
			New ideas generated by VE study cause need to reexamine the design.			
			Mitigated by use of VE PDT member from project start	L	L	(add 1 month)
				M	L	(add 2 months)
10	DE/CO	VE study generate new ideas		H	L	(add 2 months)
				L	M	(add 3 month)
				M	M	(add 3 months)
11	DE/CO	Regulatory issues	Environmental permits	H	M	(add 3 months)

Risk Response Planning

Inputs	Tools & Techniques	Outputs
1 Risk Management Plan 2 Risk Register	1 Strategies for dealing with Risks Negative / Threats: **Accept, Avoid, Transfer, Mitigate** Positive / Opportunities: **Accept, Exploit, Share, Enhance** 2 Contingent response strategy	1 Risk register updates 2 PMP update 3 Risk related Contractual Agreements

Risk Register Update

Outputs from Risk Response Planning

Risk # and Description	Date Identified	Category	Probability	Consequence	Impact	Rank Classification	Mitigation Strategy	Date to Resolve	Status	Owner (RE)	Contingency Plan
Problem Issue	When risk was identified	Type of risk	Impact with respect to Project (high, medium, low)	Impact with respect to Project (high, medium, low)	Overall Impact Budget Sched. Scope	Significance to project objectives	**What** will you do to address risk?	**When** the action will be taken	Active or Inactive	**Who** will Perform action	Summary of schedule and budget and critical dependencies

Risk Response Planning/Control

- **Risk Control** does not attempt to eliminate the source of the risk but seeks to reduce or mitigate the risks. It monitors and manages the risk in a manner that reduces the probability/likelihood and/or consequence/impact of its occurrence or minimizes the risk's effect on the program.
- **Examples:**
  - ✓ Alternative Design. Create a backup design option that uses a lower risk approach.
  - ✓ Incremental Development. Design with the intent of upgrading system parts in the future.
  - ✓ Robust Design. This approach, while it could be more costly, uses advanced design and manufacturing techniques that promote quality through design.
  - ✓ Reviews, Walk-throughs, and Inspections. These three actions can be used to reduce the probability/likelihood and potential consequences/ impacts of risks through timely assessment of actual or planned events.
  - ✓ Design of Experiments / Pilot Studies or Projects. This engineering tool identifies critical design factors that are sensitive, therefore potentially high risk, to achieve a particular user requirement.
  - ✓ Use of Standards Use of existing and proven standards and processes can substantially reduce risks.
  - ✓ Modeling/Simulation. Modeling and simulation can be used to investigate various design options and system requirement levels.
  - ✓ Demonstration Events. Demonstration events are points in the program (normally tests) that determine if risks are being successfully abated.

Risk Response Planning cont.

Risk Assumption. Risk assumption is an acknowledgment of the existence of a particular risk situation and a conscious decision to accept the associated level of risk, without engaging in any special efforts to control it.

- General cost and schedule reserve may be set aside to deal with any problems that may occur as a result of various risk assumption decisions.
- This method recognizes that not all identified program risks warrant special handling; as such, it is most suited for those situations that have been classified as low risk. The key to successful risk assumption is twofold:

  - ✓ Identify the resources (time, money, people, etc.) needed to overcome a risk if it materializes. This includes identifying the specific management actions (such as retesting, additional time for further design activities) that may occur.

  - ✓ Ensure that necessary administrative actions are taken to identify a management reserve to accomplish those management actions.

Risk Response Planning cont.

Risk Avoidance: Involves a change in the concept, requirements, specifications, and/or practices that reduce risk to an acceptable level.

- ✓ Eliminates the sources of high or possibly medium risk and
- ✓ replaces them with a lower risk solution and may be supported by a cost/benefit analysis.

Risk Transfer. Reallocate risk during the concept development and design processes from one part of the system to another, thereby reducing the overall system risk:

- ✓ Redistributing risks between the Government and the prime contractor or within Government agencies is a form of risk sharing and not risk abrogation on the part of the Government,

Risk Management: Advantages and Disadvantages

- **Advantages**
  - ✓ **Decision-making:** more accurate information, enhanced ability to access and analyze data. Documented rational supporting decision-making for audits. RM knowledge bank is built through time reduces the effort needed to manage risk successfully.
  - ✓ **Cost savings:** funding is severely limited and competitive. Providing financial opportunities and increased ability to capture gains and avoid losses.
  - ✓ **Reduce contingencies:** RM strategy can release contingency funds that could again be used to increase our mission accomplishments.
  - ✓ **Income:** reduced variability over time allowing more accurate planning of organizational concerns such as growth and resource allocation.
  - ✓ **Adaptability:** increased ability to anticipate and adjust to shifting market dynamics in line with tolerances. Focuses realignment ie. organization mission of an agile flexible workforce.
  - ✓ **System based holistic approach:** integration allows inconsistencies to be addressed and natural offsets and potential opportunities to be maximized on system level.
  - ✓ **Communication:** enhanced by promotion of understanding and commitment to projects, organization goals and missions. Promotes ownership.
  - ✓ **Reputation**: "Do it right the first time" achieved through thorough planning and control of risk.

- **Disadvantages**
  - ✓ **Resistance to change:** moving to a fully integrated risk-management model requires organizational and cultural change, and a commitment by senior executives to see the transformation through its teething problems.
  - ✓ **Cost:** transformation to a formal RM process will also be expensive. However the initial outlay of funds for resources, training and equipment are expected to be easily covered from savings generated by threat reduction.

Future Direction: Program Risk Management: Who and How?

- **Program Manager**
  - ✓ **Plan, organize, direct, and control risk management. Comply with risk management guidance. Ensure that funds are available to support approved risk-handling plans. Inform and advise decision makers, Cost Analysis Improvement Group (CAIG) and PRB on program risk and its handling.**
- **Risk Management Coordinator**
  - ✓ **Develop and maintain risk management plans. Provide risk management training. Define the risk reporting scales to be used by the program. Develop and maintain a risk management information system. Prepare risk management reports. Monitor compliance with DoDD risk management requirements. Ensure that risk management functions and tasks performed by the Sub-Tier PDTs and the PMO functional offices are fully integrated and in compliance with assigned tasks. Advise the PM and Program Level PDT on the use of risk management sources, i.e., host command functional support offices, etc. Evaluate risk assessments, risk-handling plans, and risk monitoring results as directed and recommend appropriate actions. Advise the PM on the use of independent risk assessors.**
- **Program Level (some use a Risk Management Board (RMB) for this responsibility**
  - ✓ **Ensure that the risk management program is implemented, risk reduction is accomplished in conformance with the PM's strategy, and the risk management efforts of the PDTs are integrated. Report risk events to the risk management coordinator. Evaluate whether PDTs and PMO functional offices have identified critical risks and proposed risk-handling plans. Ensure that cost, schedule, and performance risks are compatible. Ensure that cost, schedule, and performance risks are combined in a manner consistent with the plan.**
- **PMO Sub-Tier Functional Offices (Process) and (Products)**
  - ✓ **Assess risks, recommending appropriate risk-handling strategies for each identified moderate and high risk, and implementing and documenting all risk management analyses and findings within the team's product area. Coordinate all risk management findings and decisions with other PDTs, PMO functional offices, the Program Level PDT, and the risk-management coordination office. Identify funding requirements to implement risk-handling plans. Identify the need for risk management training. Report risk events to the Program Level PDT and risk coordinator.**
- **Independent Risk Assessors**
  - ✓ **Perform independent risk assessment on critical risk areas or contractor engineering processes that the PM has specified. Report the results of those assessments to the**

Resouces & References

- Prospect courses
  - ✓ COST RISK ANALYSIS BASIC
  - ✓ RISK ANALYSIS-FLOOD DAMAGE REDUC PROJCT
- PMI website
  - ✓ http://www.pmi.org/Resources/Pages/Default.aspx
- Defense Acquisition University's Risk Management CoP website
  - ✓ https://acc.dau.mil/CommunityBrowser.aspx?id=17607
- Tools
  - ✓ http://www.decisioneering.com/ Crystal Ball site
- References
  - ✓ Project Management Body Of Knowledge®
  - ✓ Project & Program Risk Management, R.M. Wideman, PMI, 1992
  - ✓ Risk and Decision Analysis in Projects, J. Schuyler, PMI 2001
  - ✓ Risk Management Guide for DOD Acquisition, 2003

Open Discussion of Project Risk Management